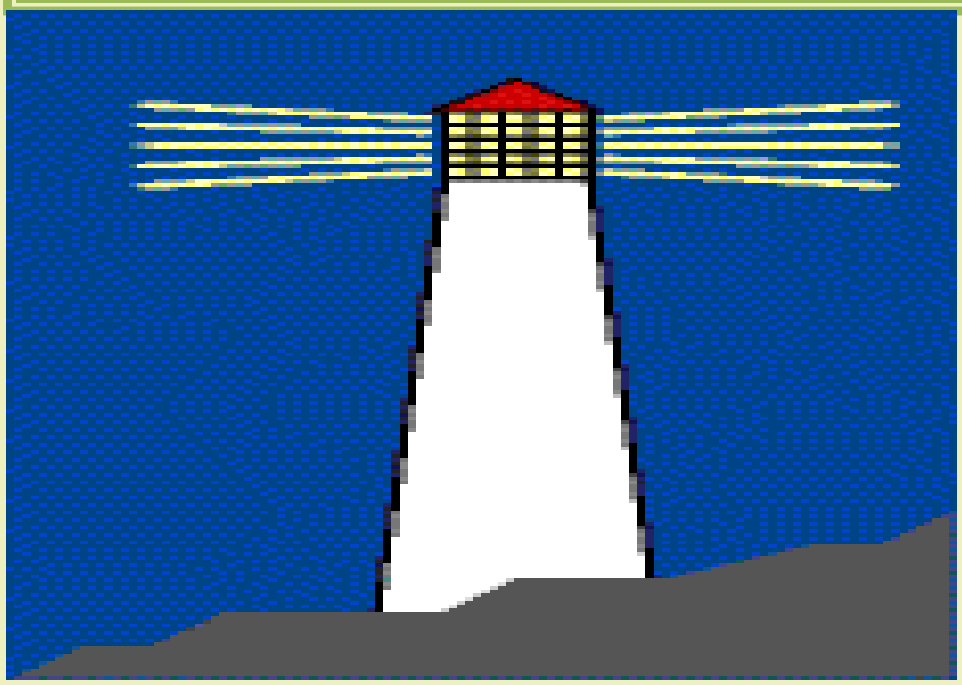
2011

SAI TECNOLOGY CAMPUS, MANAWALA, AMRITSAR



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PROJECT REPORT

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Model light house

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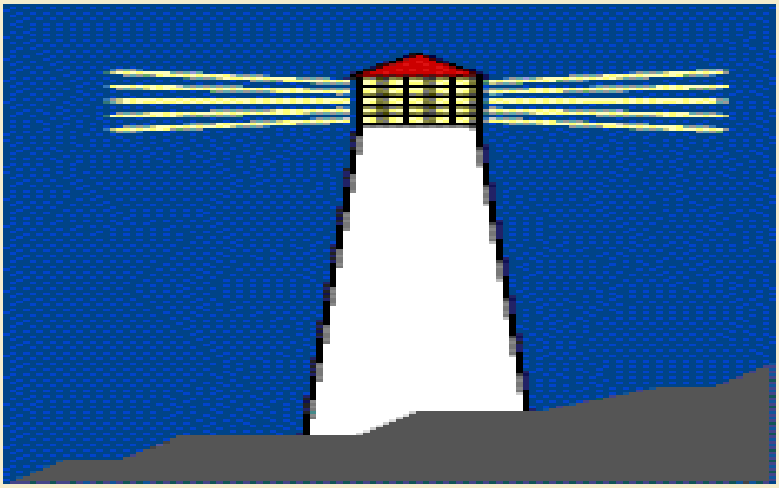
CONTENT LIST

Model light house Project

ABOUT THE PROJECT :-

This project was designed for a model lighthouse to flash a lamp in a simple sequence: two flashes of 2s with a short gap of 1s, followed by a longer gap of 5s before repeating the sequence.



INTODUCTION To IC'S:

An integrated circuit or monolithic integrated circuit (also referred to as IC, chip, or microchip) is an electronic circuit manufactured by the patterned diffusion of trace elements into the surface of a thin substrate of semiconductor material. Additional materials are deposited and patterned to form interconnections between semiconductor devices. Integrated circuits can be classified into analog, digital and mixed signal (both analog and digital on the same chip).

Digital integrated anything from one gates, flip-flops, circuits in a few

circuits can contain to millions of logic multiplexers, and other square millimeters.

The small size of these circuits allows high speed, low power dissipation, and reduced manufacturing cost compared with board-level integration. These digital ICs, typically microprocessors, DSPs, and micro controllers, work using binary mathematics to process "one" and "zero" signals.

Analog ICs, such as sensors, power management circuits, and operational amplifiers, work by processing continuous signals. They perform functions like amplification, active filtering, demodulation, and mixing. Analog ICs ease the burden on circuit designers by having expertly designed analog circuits available instead of designing a difficult analog circuit from scratch.

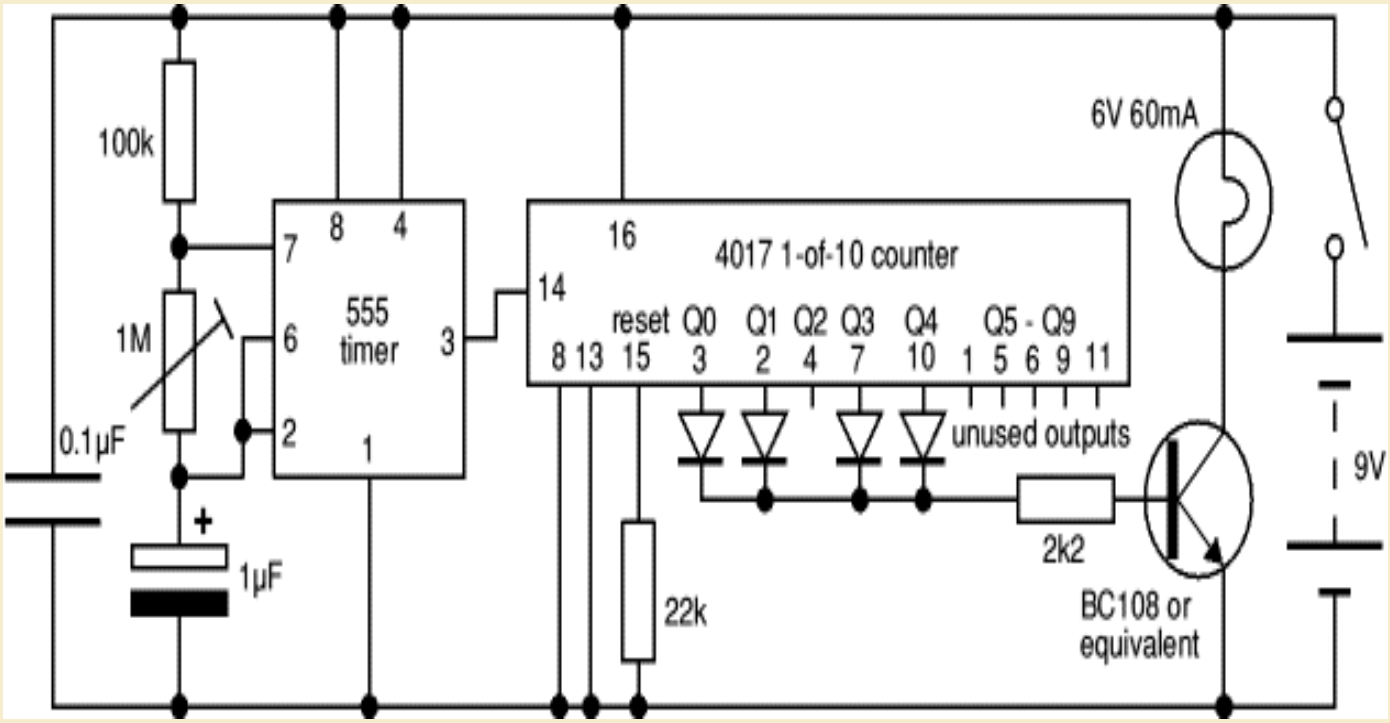
Working of project through ic's:-

The 555 timer(IC) is connected as an astable to provide clock pulses for the 4017 counter(IC) The 4017 has ten outputs (Q0 to Q9) and each one becomes high ('on') in turn as the clock pulses are received. Outputs Q0, Q1, Q3 and Q4 are combined with diodes to produce the flash sequence. A transistor amplifies the current to power the lamp, or LED if you prefer (a 470Ω LED resistor is included on the stripboard layout). The 1MΩ preset controls the time period (T) of the 555 astable from about 0.1s to 1.5s, for example set T = 1s.

For a different flash sequence connect the diodes to combine different 4017 outputs (Q0-Q9). If the full count from 0 to 9 is not required one of outputs can be connected to the reset input (pin 15). For example connecting Q8 (pin 9) to reset (pin 15) reduces the long gap at the end of the sequence to 3s (with T=1s).

This project uses a 555 astable circuit to provide the clock pulses for the 4017 counter.

Circuit Diagram :



Circuit Diagram Of Project

COMPONENTS USED IN PROJECT:

- *Resistors:- 470k,2k.22k.100k*
- *Capacitors:- 0.1,1 µF,16v radial*
- *Diodes:- 1n4148*
- *Transistor:-BC108(or equivalent)*
- *1m preset, horizontal*
- *6v 60mA mes lamp*
- *Mes lamp holder*
- *555 timer IC,such as ne555*
- *4017 counter IC*
- *Dil sockets for ic's; 8-pin,16-pin*
- *On/off switch*
- *Battery clip*
- *9v battery box for 6 a cells*
- *Stripboard;19 rows *20 holes*

ABOUT THE COMPONENTS USED

Capacitors:-

A capacitor is a small device that can be charged up with electrical energy, store it and then release it. Just like a rechargeable battery. But unlike a battery, it does not use a chemical reaction and it can only hold a very small charge. A very large capacitor can only light up an LED for a few seconds. The bigger the capacitor, the more charge it will hold.

A capacitor is made from two metal plates or metal foils separated by an insulator Called a Dielectric material.

The Dielectric materials can be made from Ceramic, Mica, Polypropylene, Polyester, Electrolytic, Tantalum and even air.

The Unit of Capacitance (C)-

Capacitance is measured in Farads.

1F =1,000,000µF 1µF = 1000nF 1nF = 1000pF

Use of Capacitors.

Capacitors are used in following ways:-

1. *Store a voltage for a period of time,*
2. *Create a time delay circuit.*
3. *Shorten or extend pulse lengths,*
4. *Smooth fluctuating voltages,*
5. *Filter unwanted frequencies,*
6. *Allows Alternating Current (ac) to pass to another part of a circuit but blocks Direct Current (dc).*

Diodes:-

A diode is a dispositive made of a semiconductor material, which has two terminals or electrodes (di-ode), that act like an on-off switch. When the diode is "on", it acts as a short circuit and passes all current. When it is "off", it behaves like an open circuit and passes no current. The two terminals are different and are marked as plus and minus in figure 1. If the polarity of the applied voltage matches that of the diode (forward bias), then the diode turns "on". When the applied voltage polarity is opposite (reverse bias), it turns "off". Of course this is the theoretical behavior of an ideal diode, but it can be seen as a good approximation for a real diode.

A diode is simply a pn junction with the following characteristics:

• Under forward bias, it needs a small voltage to conduct. This voltage drop is maintained during conduction.

• The maximum forward current is limited by heat-dissipation ability of the diode. Usually it is around 1000 mA.

• There is a small reverse current.

Mes lamp:-

These are the standard small lamps. The bulb diameter is usually about 10mm, but tubular bulbs are also available. MES lamps have one contact on the base and the body forms the other contact. They are available with a good range of voltage and power (or current) ratings. Lens ended versions are available to produce a focused beam of light.

Transistor:-

A transistor is a small electronic device that can cause changes in a large electrical output signal by small changes in a small input signal. That is, a weak input signal can be amplified (made stronger) by a transistor. For example, very weak radio signals in the air can be picked up by a wire antenna and processed by transistor amplifiers until they are strong enough to be heard by the human ear. A transistor consists of three layers of silicon or germanium semiconductor material. Impurities are added to each layer to create a specific electrical positive or negative charged behavior. "P" is for a positive charged layer and "N" is for a negative charged layer. Transistors are either NPN or PNP in the configuration of the layers. There is no particular difference here except the polarity of voltages that need to be applied to make the transistor operate. The weak input signal is applied to the center layer called the base and usually referenced to ground which is also connected to the bottom layer called the emitter. The larger output signal is take from the collector also referenced to ground and the emitter. Additional resistors and capacitors are required along with at least one DC power source to complete the transistor amplifier. You should have already studied the basic

electricity and basic electronics sections of this web site and have a fairly good understanding of how resistors and capacitors effect electrical circuits

Preset:-

A preset resistor also known as a potentiometer is a type of resistor whose resistance is selected by the user. A preset maybe of any range i.e. from 1k to 100k or from 1M to 100M.
a preset is used in many circuits where varying resistance is required

555 Timer IC:-

One of the most versatile linear ICs is the 555 timer which was first introduced in early 1970 by Signetic Corporation giving the name as SE/NE 555 timer. The 555 is a monolithic timing circuit that can produce accurate and highly stable time delays or oscillation. Like general-purpose op-amps, it is very much reliable, easy to use and cheaper in cost. It has a variety of applications including monostable and astable multivibrators, dc-dc converters, digital logic probes, waveform generators, analog frequency meters and tachometers, temperature measurement and control devices, voltage regulators etc. The timer basically operates in one of the two modes either as a monostable (one-shot) multivibrator or as an astable (free-running) multivibrator.The SE 555 is designed for the operating temperature range from – 55°C to 125° while the NE 555 operates over a temperature range of 0° to 70°C.

The important features of the 555 timer are :

- *It operates from a wide range of power supplies (+ 5 V to + 18 V supply voltage).*
- *Sinking or sourcing 200 mA of load current.*
- *Proper selection of only a few external components allows timing intervals of several minutes or frequencies as high a several hundred kHz.*
- *It has a high current output; the output can drive TTL.*
- *It has a temperature stability of 50 parts per million (ppm) per degree Celsius change in temperature, or equivalently 0.005 %/ °C.*
- *It has an adjustable duty cycle; the maximum power dissipation per package is 600 mW and its trigger and reset inputs are logic compatible.*

4017 Counter IC:- T

The count advances as the clock input becomes high (on the rising-edge). Each output Q0-Q9 goes high in turn as counting advances. For some functions (such as flash sequences) outputs may be combined using diodes.

The reset input should be low (0V) for normal operation (counting 0-9). When high it resets the count to zero (Q0 high). This can be done manually with a switch between reset and +Vs and a 10k resistor between reset and 0V. Counting to less than 9 is achieved by connecting the relevant output (Q0-Q9) to reset, for example to count 0,1,2,3 connect Q4 to reset.

The disable input should be low (0V) for normal operation. When high it disables counting so that clock pulses are ignored and the count is kept constant

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